B24

267. (Amended) A computer-readable medium on which is stored a computer program for providing a method for recognizing a pattern in information comprising data and forming a predominant configuration, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

b.) storing the activation probability parameter in memory;

c.) generating a probability operand based on the activation probability parameter;

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein recognition of a pattern in information is achieved when said probability operand is said desired value, and

e.) repeating steps a-d to form a predominate configuration.

REMARKS

Entry of this amendment and remarks to reduce the issues for appeal is respectfully requested.

Claims 51-322 are pending in the application.

Claims 242 and 244-247 have been amended to correct a minor typographical by making them dependent upon claim 237.

Claim 267 has been amended to correct a typographical error by replacing the term "method" with - - computer-readable medium- -.

Claims 51 and 118 have been amended only to add an input and/or output steps, as suggested by the Examiner, to address the Section 101 rejection. No claims have been amended to overcome prior art. No new matter has been added. Appellant reserves the right to prosecute the subject matter of the original claims in a continuing application.

Claims 83, 94, 137, 138, 142, 193, 204, 205, 243, 248 and 252 and the present specification have been amended to correct a minor typographical error by replacing the term "SQRT (N/a)" with the term "(SQRT N)/a." No new matter has been added by these amendments for the many reasons discussed below. No claims have been amended to overcome prior art.

In paragraph No. 2 of the Office Action, the Examiner objected to the specification. In response, Appellant respectfully submits that on skilled in the art reading and comprehending the present specification would have readily understood that the term "SQRT (N/a)" was a typographical error and should have been "(SQRT N)/a" through all of the formulae on page 13, lines 29-30; page 14, line 2; page 15, line 21; page 16, lines 1 and 3; page 18, lines 26 and 29; page 19, lines 1 and 3; page 46, 7; page 49, page 10; page 50, line 23; page 52, lines 11-13; page 82, line 34; page 84, line 8; page 100, line 20; and page 101, lines 1, 6 and 17.

These objections raised by the examiner are merely typographical errors which one skilled in the art would readily have corrected. The term "(SQRT)/a" is correctly shown on page 14, lines 17-18; page 15, line 1; page 20, lines 2, 7, 15 and 21; page 34, lines 6, 11, 14, and 19; page 43, lines 10-15; page 45, lines 4-8; page 46, line 28; page 47, lines 3, 13, and 15; page 48, line 16 and18; page 50, line 6; page 51, line 11; page 63, lines 1-2; page 65, line 23; page 69, line 19; page 70, lines 4 and 5; page 71, lines 5-14; page 72, lines 2-4; page 73, lines 4, 8, 15 and 16; page 74, lines 14 and 23; page 75, lines 3, 12, 13 and last line; page 76, lines 1, 4 and 14; page 77, lines 17, 29 and last line; page 78, lines 5, 15 and 23; page 79, line 21; page 80, line 1; page 82, lines 14 and16; page 83, line 25; page 99, lines 16-20; and page 100, lines 3-4 and 7; page.

At page 13 line 27 to page 14 line 3, the specification teaches, "The filter 34 can be a time delayed Gaussian filter in the time domain. The filter may be characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ (corrected) is a delay parameter, α is a half-width parameter, and t is the time parameter. The Gaussian filter may comprise a plurality of cascaded stages each stage having a decaying exponential system function between stages. The filter, in frequency space, can be characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ (corrected) and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter." The derivation for this filter is based on the derivation provided in SUB-APPENDIX II found on page 60, line 1 to page 64, line 36 of the present specification. One skilled in the art would have readily understood from this derivation that the correct formula is "(SQRT N)/a". Furthermore, a delayed Gaussian filter in time and its Fourier transform are known as shown by Siebert, W. McC., Circuits, Signals, and Systems, The MIT Press, Cambridge, Massachusetts, (1986), pp. 488-502, copies attached. No new matter has been added by correcting this minor typographical error.

In the Office Action, the Examiner rejected claims 51-322 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Appellant respectfully disagrees with the basis for the Examiner's rejection and believes that claims 51-322 fully comply with the requirements of Section 101, as well as the Computer-Implemented Invention Guidelines issued by the U.S. Patent and Trademark Office. However, to reduce the issues for appeal, Appellant has amended claims 51, 118 and 157 to include the input and/or output steps suggested by the Examiner.

In order to reduce the issues for Appeal, entry of this amendment is respectfully requested.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

Randell L. Mills

Serial No. 09/220,970

Filed: December 23, 1998

Group Art Unit: 2721

Examiner: B. Tadayon

Attorney Docket: 62-231

Title: A METHOD AND SYSTEM FOR PATTERN RECOGNITION AND PROCESSING

February 9, 2001

EXPLANATION OF AMENDMENTS TO REDUCE ISSUES FOR APPEAL

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

IN THE SPECIFICATION:

Paragraph on page 1, line 32 through page 2, line 14:

The system of the present invention includes an Input Layer for receiving data representative of physical characteristics or representations of physical characteristics capable of transforming the data into a Fourier series in Fourier space. The data is received within an input context representative of the physical characteristics that is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies. The system includes a memory that maintains a set of initial ordered Fourier series. The system also includes an Association Layer that receives a plurality of the Fourier series in Fourier space including at least one ordered Fourier series from the memory and forms a string comprising a sum of the Fourier series and stores the string in memory. The system also includes a String Ordering Layer that receives the string from memory and orders the Fourier series contained in the string to form an ordered string and stores the ordered string in memory. The system also includes a Predominant Configuration

Layer that receives multiple ordered strings from the memory, forms complex ordered strings comprising associations between the ordered strings, and stores the complex ordered strings to the memory. The components of the system are active based on probability using weighting factors based on [an] activation rates.

Paragraph on page 2, line 15 through page 4, line 10:

Another aspect of the present invention is directed to ordering a string representing the information. This aspect of the invention utilizes a High Level Memory section of the memory that maintains an initial set of ordered Fourier series. This aspect of the invention includes obtaining a string from the memory and selecting at least two filters from a selected set of filters stored in the memory. This aspect also includes sampling the string with the filters such that each of the filters produce a sampled Fourier series. Each Fourier series comprises a subset of the string. This aspect also includes modulating each of the sampled Fourier series in Fourier space with the corresponding selected filter such that each of the filters produce an order formatted Fourier series. Furthermore, this aspect includes adding the order formatted Fourier series produced by each filter to form a summed Fourier series in Fourier space, obtaining an ordered Fourier series from the memory, determining a spectral similarity between the summed Fourier series and the ordered Fourier series, determining a probability expectation value based on the spectral similarity, and generating a probability operand having a value selected from a set of zero and one, based on the probability expectation value. These steps are repeated until the probability operand has a value of one. Once the probability operand has a value of one, this aspect includes storing the summed Fourier series to an intermediate memory section. Thereafter, this aspect includes removing the selected filters from the selected set of filters to form an updated set of filters, removing the subsets from the string to obtain an updated string, and selecting an updated filter from the updated set of filters. This aspect further includes sampling the updated string with the updated filter to produce a sampled Fourier series comprising a subset of the string, modulating the sampled Fourier series in

Fourier space with the corresponding selected updated filter to produce an updated order formatted Fourier series, recalling the summed Fourier series from the intermediate memory section, adding the updated order formatted Fourier series to the summed Fourier series to form an updated summed Fourier series in Fourier space, and obtaining an updated ordered Fourier series from the memory. This aspect further includes determining a spectral similarity between the updated summed Fourier series and the updated ordered Fourier series, determining a probability expectation value based on the spectral similarity, and generating a probability operand having a value selected from a set of zero and one, based on the probability expectation value. These steps are repeated until the probability operand has a value of one or all of the updated filters have been selected from the updated set of filters. If all of the updated filters have been selected before the probability operand has a value of one, then clearing the intermediate memory section and repeating the steps starting with selecting at least two filters from a selected set of filters. Once the probability operand has a value of one, the updated summed Fourier series is stored to the intermediate memory section and steps beginning with removing the selected filters from the selected set of filters to form an updated set of filters are repeated until one of the following set of conditions is satisfied: the updated set of filters is empty or the remaining subsets of the string is nil. If the remaining [subset] <u>subsets</u> of the [strings] <u>string</u> is nil, then the Fourier series in the intermediate memory section is stored in the High Level Memory section of the memory.

Paragraph on page 13, lines 1-26:

Referring again to Figure 2, several [the] parameterized Fourier components are input to the Association Layer to form associations of the Fourier series. The Fourier components may be stored in a Fourier component section 30 of a temporary memory section 28. The Fourier components are added to form multiple Fourier series which in turn may be stored in a Fourier series section 32 of the temporary memory section 28. At least one of the Fourier series stored in the Fourier series section 32 is input to a filter 34 wherein the filter 34 samples and modulates the

Fourier series. The filtered Fourier series is input to a spectral similarity analyzer 36. The spectral similarity analyzer 36 determines the spectral similarity between the filtered Fourier series and another Fourier series stored in the Fourier series section 32 of the temporary memory section 28. A spectral similarity value is output from the spectral similarity analyzer 36 and input to a probability expectation analyzer 38. The probability expectation analyzer 38 determines a probability expectation value based on the spectral similarity value. The probability expectation value output from the probability expectation analyzer 38 is input to a probability operand generator 40. The probability operand generator 40 generates a probability operand value of one or zero based upon the probability expectation value. The probability operand value is output to a processor 42. If the probability operand value is zero, the processor 42 sends another Fourier series from the Fourier series section 32 of the temporary memory section 28 to the filter 34 and begins the process again. If the probability operand value is one, the filtered Fourier series and the other Fourier series are added to form a string and the string is stored in a string memory section 44.- -

Paragraph on page 13, line 27 through page 15, line 8, with the following paragraph:

- -The filter 34 can be a time delayed Gaussian filter in the time domain. The filter may be characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}}e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ is a delay parameter, α is a half-width parameter, and t is the time parameter. The Gaussian filter may comprise a plurality of cascaded stages each stage having a decaying exponential system function between stages. The filter, in frequency space, can be characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2}e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter. The probability distribution may be Poissonian. Thus, the probability expectation value can be based upon Poissonian probability. The probability expectation value may be characterized by

$$\prod_s \left[p_{\uparrow_s} + \left(P - p_{\uparrow_s}\right)\exp\left[-\beta_s^{-2}\left(\frac{1-\cos 2\phi_s}{2}\right)\right]\cos\left(\delta_s + 2\sin\phi_s\right)\right]$$

wherein P is the maximum probability of at least one other Fourier series being associated with a first Fourier series, $p_{\uparrow_s}$ is a probability of at least one other Fourier series being associated with a first Fourier series in the absence of coupling of the first Fourier series with the at least one other Fourier series, β_s^2 is a number that represents the amplitude of spectral similarity between at least two filtered or unfiltered Fourier series, ϕ_s represents the frequency difference angle between at least two filtered or unfiltered Fourier series, and δ_s, is a phase factor. β_s^2 may be characterized by

$$\beta_s^2 = (8\pi)^2 \frac{1}{\sqrt{2\pi}} \sqrt{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}}$$

$$\sum_{m_1=1}^{M_1} a_{0_{m_1}} N_{m_1} \sum_{m_s=1}^{M_s} a_{0_{m_s}} N_{m_s} \exp - \left\{ \frac{\frac{\alpha_1^2 \alpha_s^2}{\alpha_1^2 + \alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)^2}{2} \right\}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation velocities, and N_{m_1}, N_{m_s}, $\rho_{0_{m_1}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. ϕ_s may be characterized by

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}} - \sum_{m_s=1}^{M_s} \frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1} \frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}}$$

$\frac{\sqrt{N_1}}{\alpha_1}$ and $\frac{\sqrt{N_s}}{\alpha_s}$ correspond to delay parameters of a first and s-th time delayed Gaussian filter, respectively, α_1 and α_s corresponding half-width parameters of a first and s-th time delayed Gaussian filter, respectively, M_1 and M_s are integers, $a_{0_{m_1}}$ and $a_{0_{m_s}}$ are constants, v_{m_1} and v_{m_s} are constants such as the signal propagation

velocities, and N_{m_l}, N_{m_s}, $\rho_{0_{m_l}}$, and $\rho_{0_{m_s}}$ are data parameters. The data parameters are selected in the same manner as described above. - -

Replace the paragraph on page 15, line 19 through page 16, line 12, with the following paragraph:

- - An exemplary string with each Fourier series multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ that established the association to form the string is:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho 0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{f0_{s,m}}+\rho_{i_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

[$e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ that established the association to form the stringis:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho 0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{f0_{s,m}}+\rho_{i_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$
]

wherein v_{sp_0} and v_{sz_0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\underline{\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}} \text{ and } \frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}}$ $\left[\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}} \text{ and } \sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}\right]$ are delay parameters and α_{sp_0} and α_{sz_0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters. The data parameters are selected in the same manner as described above.- -

Replace the paragraph on page18, line 23 through page 19, line 12, with the following paragraph:

- - Each filter of the set of filters can be a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled. Each filter of the set of filters can be a time delayed Gaussian filter having a delay parameter $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ which corresponds to a time point. Each Fourier series of the ordered string can be multiplied by the Fourier transform of the delayed Gaussian filter represented by $\underline{e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}}$. The filter established <u>the correct order. The ordered string can be represented by:</u>

$$\underline{\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)} e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)}$$

[$e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ The filter established the correct order. The ordered string can be represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\operatorname{sin}\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\operatorname{sin}\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$]

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\underline{\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}}$ and $\underline{\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}}$ [$\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}$ and $\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}$] are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters. The data parameters are selected in the same manner as described above.- -

Replace the paragraph on page 46, lines 1-21, with the following paragraph:

- - i.) in one analog embodiment, the output $V_{\sum_m}$ in Fourier space is the "string" given by Eq. (37.113) comprising the superposition of S "groups of SFCs" wherein each "SFCs" corresponds to the response of M "M or P elements", with input context. In another embodiment, the output $V_{\sum_m}$ is the "string" of Eq. (37.114)

$$V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}\left(v_{sz0}k_z\right)}$$

$$e^{-jk_\rho\left(\rho_{f0_{s,m}}+\rho_{s_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

$$V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho 0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}\left(v_{s\rho 0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}\left(v_{sz0}k_z\right)}$$

$$e^{-jk_\rho\left(\rho_{f0_{s,m}}+\rho_{s_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2},\right)$$

(37.114)

wherein each "SFCs" is multiplied by the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) (i.e. the modulation factor $e^{-\frac{1}{2}\left(v_{s,m}\frac{k_\rho}{\alpha}\right)^2}e^{-j\sqrt{N}\left(v_{s,m}\frac{k_\rho}{\alpha}\right)}e^{-\frac{1}{2}\left(v_{s,m}\frac{k_z}{\alpha}\right)^2}e^{-j\sqrt{N}\left(v_{s,m}\frac{k_z}{\alpha}\right)}$) which gave rise to "coupling" and "association" to form the "string". In the digital case, the output $V_{\sum_m}$ in Fourier space is the "string" given by Eq. (37.113) comprising the superposition of S "groups of SFCs" wherein each "SFCs" corresponds to a matrix digitized according to Eq. (37.110), with input context. In another embodiment of the digital case, the output $V_{\sum_m}$ is the "string" of Eq. (37.114) wherein each "SFCs" corresponds to a matrix digitized according to Eq. (37.110) that is multiplied by a digitized matrix according to the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) which gave rise to the "coupling" and "association" to form the "string".- -

Replace the paragraph on page 49, lines 3-21, with the following paragraph:

-- The output of an association filter is the convolution of the input "groups of SFCs" (each "SFCs" is given by Eqs. (37.33) and (37.33a)) of a "string" (Eq. 37.108) or the string itself with a delayed Gaussian. In terms of the matrix method of analysis (hereafter "MMA"), the filter parameter α of the time delayed Gaussian filter corresponds to the acquisition of the composition of a polynucleotide member of a nested set of subsets. The time delay (time domain) and modulation (frequency domain) parameter $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ determines the center of mass of the output, and it corresponds to the terminal nucleotide data. By forming "associations" with input from "High Level Memory", the "processor" determines the relative position of the center of mass of each Fourier series such as a "group of SFCs" as either "before" or "after" the center of mass of the preceding and succeeding Fourier series "associated" with Fourier series input from "High Level Memory". The complete set of Fourier series "associated" with Fourier series input from "High Level Memory" covers all of the frequencies of the "string". By Parseval's theorem, by processing the entire interval in $k,\omega-$space, the information is entirely processed in the time domain. The order such as temporal order of the Fourier series representing information is determined using the MMA.--

Replace the paragraph on page 49, line 31 through page 50, line 27, with the following paragraph:

-- Input to form "associations" is provided by changing the decay constant α and the number of "stages" in the cascade N, or by processing "a SFCs" of a "string" using an "association ensemble" with different parameters α and N over all "groups of SFCs" that make up the entire "string". Each "group of SFCs" is determined to be on the $t=t_i$-side or the $t=t_f$-side of the "axis" of the "string" corresponding to the 5'-side or 3'-side of the "axis" of a polynucleotide to be sequenced via the Matrix Method of Analysis. A feedback loop comprises sequentially switching to different "known", "set", or "hardwired" delayed Gaussian filters which corresponds to changing the decay constant, α_s, with a concomitant change in the half-width parameter, α_s, and the number of elements, N_s, with a concomitant change in the delay, $\frac{\sqrt{N_s}}{\alpha_s}$, where each α_s and $\frac{\sqrt{N_s}}{\alpha_s}$ is "known" from past experiences and associations. The feedback loop whereby information from memory encoded in the

"string" is filtered and delayed (modulated and sampled in frequency space) to provide "FCs", "SFCs" or "groups of SFCs" which are "associated" with input from "High Level Memory" provides the data acquisition and processing equivalent to the formation, acquisition, and analysis of the composition and terminal nucleotide data of a set of "sequential subsets" of the Matrix Method of Analysis. Changing the filters which process the "string" corresponds to changing the "guess" of the "known" nucleotides, $K_1K_2K_3K_4\cdots K_{n'}$, as well as the "unknown" nucleotides, $X_1, X_2, X_3, X_4\cdots$, of the Matrix Method of Analysis as applied to DNA sequencing. The order of the "groups of SFCs" of the "string" is established when "associations" with the "High Level Memory" are achieved for a given set of delayed Gaussian filters. Then each Fourier series of the ordered "string" is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" may be multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$

$$\left[e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)} \right]$$

that established the correct order to form the ordered "string". The total output response $V_{\sum_m}$ in Fourier space comprising the superposition of S "groups of SFCs" wherein each "SFCs" corresponds to the response of M "M or P elements", with input context, is the "string" given by Eq. (37.113).- -

Replace the paragraph on page 52, lines 5-14, with the following paragraph:

- - h.) the "groups of SFCs" of the " P string" of the form of Eqs. (37.113-37.115) that are parameterized according to their relative order are recorded to the "High Level Memory". For example, each Fourier series of the ordered string is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ that established the correct order to form the ordered "string" represented by

$$V_{\sum_{s,m}}(k_\rho,k_z)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}a_{0_{s,m}}N_{s,m_{\rho_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)}e^{-jk_\rho\rho_{f s,m}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)$$

[

$e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ that established the correct order to form the ordered "string" represented by

$$V_{\sum_{s,m}}(k_\rho,k_z)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}a_{0_{s,m}}N_{s,m_{\rho_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)}e^{-jk_\rho\rho_{f s,m}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)$$

]

(37.115).- -

Replace the two paragraphs from page 82, line 27 through page 84, line 9, with the following two paragraphs:

- - The output of an association filter is the convolution of the input "groups of SFCs" (each "SFCs" given by Eqs. (37.33) and (37.33a)) of a "string" (Eq. 37.108) or the "string" itself with a delayed Gaussian. In terms of the matrix method of analysis (hereafter "MMA"), the filter parameter α of the time delayed Gaussian filter corresponds to the acquisition of the composition of a polynucleotide member of a nested set of subsets. The time delay (time domain) and modulation (frequency domain) parameter $\frac{\sqrt{N}}{\alpha}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ determines the center of mass of the output, and it corresponds to the terminal nucleotide data. By forming "associations" with input from "High Level Memory" as given in SUB-APPENDIX III--Association Mechanism and Basis of Reasoning, the "processor" determines the relative position of the center of mass of each Fourier series such as a "group of SFCs" as either "before" or "after" the center of mass of the preceding and succeeding Fourier series "associated" with Fourier series input from "High Level Memory". The complete set of Fourier series "associated" with Fourier series input from "High Level Memory" covers all of the frequencies of the "string". By Parseval's theorem, by processing the entire interval in k,ω -space, the information is entirely processed in the time domain. The order such

as temporal order of the Fourier series representing information is determined using the MMA.

Input to form associations is provided by changing the decay constant α and the number of "stages" in the cascade N, or by processing each "group of SFCs" of a "string" using an "association ensemble" with different parameters α and N over all "groups of SFCs" that make up the entire "string". Each "group of SFCs" is determined to be on the $t = t_i$-side or the $t = t_f$-side of the "axis" of the "string" corresponding to the 5'-side or 3'-side of the "axis" of a polynucleotide to be sequenced via the Matrix Method of Analysis. A feedback loop comprises sequentially switching to different "known", "set", or "hardwired" delayed Gaussian filters which corresponds to changing the decay constant, α_s, with a concomitant change in the half-width parameter, α_s, and the number of elements, N_s, with a concomitant change in the delay, $\frac{\sqrt{N_s}}{\alpha_s}$, where each α_s and $\frac{\sqrt{N_s}}{\alpha_s}$ is "known" from past experiences and associations. The feedback loop whereby information from memory encoded in the "string" is filtered and delayed (modulated and sampled in frequency space) to provide "FCs", "SFCs" or "groups of SFCs" which are associated with input from "High Level Memory" provides the data acquisition and processing equivalent to the formation, acquisition, and analysis of the composition and terminal nucleotide data of a set of "sequential subsets" of the Matrix Method of Analysis. Changing the filters which process the "string" corresponds to changing the "guess" of the "known" nucleotides, $K_1K_2K_3K_4 \cdots K_{n'}$, as well as the "unknown" nucleotides, $X_1, X_2, X_3, X_4 \cdots$, of the Matrix Method of Analysis as applied to DNA sequencing. The order of the "groups of SFCs" of the "string" is established when "associations" with the "High Level Memory" are achieved for a given set of delayed Gaussian filters (i.e. the order of Fourier series representing information is solved when internal consistence is achieved according to the MMA). Then each Fourier series of the ordered "string" is recorded to the "High Level Memory" wherein each Fourier series of the ordered "string" may be multiplied by the Fourier transform of the delayed Gaussian filter represented by

$$\frac{e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}}{\left[e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)} \right]}$$

that established the correct order to form the ordered "string".- -

Replace the two paragraphs on page 99, line 10 through page 101, line 26, with the following two paragraphs:

- - "Associations" are established between Fourier series such as "SFCs" and "groups of SFCs" (i.e. a "string" is created) by "coupling" with Poissonian probability between "association ensembles" "carrying" the "SFCs" and "groups of SFCs". Input context is encoded by the transducer frequency band modulation factor $e^{-jk_p(\rho_{fb_s m}+\rho_{t_s m})}$ according to Eq. (37.110). In this case, Eq. (37.87b) is

$$\beta_s^2=(8\pi)^2\frac{1}{\sqrt{2\pi}}\sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}}\sum_{m_1=1}^{M_1}a_{0_{m_1}}N_{m_1}\sum_{m_s=1}^{M_s}a_{0_{m_s}}N_{m_s}$$
$$\exp-\left\{\frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\left(\frac{N_{m_1}t_{0_{m_1}}}{2}+t_{fb_{m_1}}+t_{t_{m_1}}\right)-\left(\frac{N_{m_s}t_{0_{m_s}}}{2}+t_{fb_{m_s}}+t_{t_{m_s}}\right)\right)^2}{2}\right\}$$

(37.111a)

And, Eq. (37.87c) is

$$\beta_s^2=(8\pi)^2\frac{1}{\sqrt{2\pi}}\sqrt{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}}\sum_{m_1=1}^{M_1}a_{0_{m_1}}N_{m_1}\sum_{m_s=1}^{M_s}a_{0_{m_s}}N_{m_s}$$
$$\exp-\left\{\frac{\frac{\alpha_1^2\alpha_s^2}{\alpha_1^2+\alpha_s^2}\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)-\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}+\frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}}+\frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)^2}{2}\right\}$$

(37.111b)

The corresponding frequency difference angle, ϕ_s, which follows from Eq. (37.89) is

$$\phi_s=\frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1}-\frac{\sqrt{N_s}}{\alpha_s}+\sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)-\sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}\rho_{0_{m_s}}}{2v_{m_s}}+\frac{\rho_{fb_{m_s}}}{v_{fb_{m_s}}}+\frac{\rho_{t_{m_s}}}{v_{t_{m_s}}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1}+\sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}\rho_{0_{m_1}}}{2v_{m_1}}+\frac{\rho_{fb_{m_1}}}{v_{fb_{m_1}}}+\frac{\rho_{t_{m_1}}}{v_{t_{m_1}}}\right)}$$

(37.112a)

The corresponding frequency difference angle, ϕ_s, which follows from Eq. (37.90) is

$$\phi_s = \frac{\pi\left(\frac{\sqrt{N_1}}{\alpha_1} - \frac{\sqrt{N_s}}{\alpha_s} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}t_{0_{m_1}}}{2} + t_{fb_{m_1}} + t_{t_{m_1}}\right) - \sum_{m_s=1}^{M_s}\left(\frac{N_{m_s}t_{0_{m_s}}}{2} + t_{fb_{m_s}} + t_{t_{m_s}}\right)\right)}{\frac{\sqrt{N_1}}{\alpha_1} + \sum_{m_1=1}^{M_1}\left(\frac{N_{m_1}t_{0_{m_1}}}{2} + t_{fb_{m_1}} + t_{t_{m_1}}\right)} \tag{37.112b}$$

Eq. (37.108), the "read" total response $V_{\sum_m}$ in Fourier space comprising the superposition of S "SFCs" wherein each "SFCs" corresponds to the response of M_s "M or P elements", with input context encoded by the modulation factor $e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$, becomes the following "string".

$$V_{\sum_{s,m}}(k_\rho,k_z) = \sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} \frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}$$
$$\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right) \tag{37.113}$$

where $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$ and $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$. $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities. In another embodiment, the output $V_{\sum_m}$ is the Gaussian sampled and modulated "string" of Eq. (37.113) wherein each "SFCs" is multiplied by the Fourier transform of the delayed Gaussian filter (Eq. (37.50)) (i.e. the modulation factor ~~$e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$~~)

$$\left[e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)} \right]$$

which gave rise to "coupling" and "association" to form the "string". $V_{\sum_m}$ is given by

$$V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{s\rho0}\frac{k_\rho}{\alpha_{s\rho0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho0}}}{\alpha_{s\rho0}}\left(v_{s\rho0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}\left(v_{sz0}k_z\right)}$$

$$e^{-jk_\rho\left(\rho_{fbs,m}+\rho_{ts,m}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

[

$$V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{s\rho0}\frac{k_\rho}{\alpha_{s\rho0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho0}}{\alpha_{s\rho0}}}\left(v_{s\rho0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}\left(v_{sz0}k_z\right)}$$

$$e^{-jk_\rho\left(\rho_{fbs,m}+\rho_{ts,m}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

]

(37.114)

wherein input context is encoded by the modulation factor $e^{-jk_\rho\left(\rho_{fbs,m}+\rho_{ts,m}\right)}$. Eq. (37.114) is also an exemplary "string" with each Fourier series multiplied by the Fourier transform of the delayed Gaussian filter represented by

$$e^{-\frac{1}{2}\left(v_{s\rho0}\frac{k_\rho}{\alpha_{s\rho0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho0}}}{\alpha_{s\rho0}}\left(v_{s\rho0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}\left(v_{sz0}k_z\right)}$$

[

$$e^{-\frac{1}{2}\left(v_{s\rho0}\frac{k_\rho}{\alpha_{s\rho0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho0}}{\alpha_{s\rho0}}}\left(v_{s\rho0}k_\rho\right)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}\left(v_{sz0}k_z\right)}$$

]

that established the correct order to form the ordered "string" given in SUB-APPENDIX IV--Ordering of Associations: Matrix Method. The index over s is independent of m since each "FC" of a given "SFCs" is filtered by the same Gaussian filter. In embodiments, the index for the Gaussian filter is not independent of m. In one case, some "FCs" may be filtered by the same Gaussian filters; whereas, other "FCs" may be filtered by different Gaussian filters. In another case, each "FC" may be filtered by a different Gaussian filter.

For the case where $v_{s,m}t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$., the "string" in Fourier space is one dimensional in terms of k_ρ and is given by

$$\underline{V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}a_{0_{s,m}}N_{s,m_{\rho_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)}e^{-jk_\rho\rho_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)}$$

$$\left[V_{\sum_{s,m}}\left(k_\rho,k_z\right)=\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}a_{0_{s,m}}N_{s,m_{\rho 0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}\left(v_{s\rho 0}k_\rho\right)}e^{-jk_\rho\rho_{0_{s,m}}}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\right]$$

(37.115)

The "string" comprises a Fourier series, a linear sum of "FCs" each multiplied by its corresponding Gaussian filter modulation factor and modulation factor which encodes input context (Eqs. (37.114-37.115)). FIGURE 19 is a flow diagram of an exemplary hierarchical relationship of the signals in Fourier space comprising "FCs", "SFCs", "groups of SFCs", and a "string" in accordance with the present invention. Each "FC" is encoded by a "P element" or stored into and/or recalled from a "M element" as shown in FIGURE 18.- -

IN THE CLAIMS

Please replace claims 51, 83, 94, 95, 118, 137, 138, 142, 157, 193, 204, 205, 242, 244-247, 248, 252 and 267 with the following claims 51, 83, 94, 95, 118, 137, 138, 142, 157, 193, 204, 205, 242, 244-247, 248, 252 and 267:

51. (Amended) A method for recognizing a pattern in information comprising data, the method comprising:

inputting data;

encoding data as parameters of a plurality of Fourier components in Fourier space;

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value; [and]

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value; and

outputting a recognized pattern.

83. (Amended) A method according to claim 79, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter

represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

[$e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho0}}N_{s,m_{z0}}e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$
]

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ [$\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}$ and $\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}$] are delay parameters and α_{sp0} and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

94. (Amended) A method according to claim 91, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{-\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

95. (Amended) A method according to claim 94, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

118. (Amended) A method for recognizing a pattern in information, the method comprising:

<u>inputting information;</u>

representing the information as a plurality of Fourier series in Fourier space; [and]

forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved<u>; and</u>

<u>outputting a recognized pattern in the information</u>.

137. (Amended) A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ which corresponds to a time point.

138. (Amended) A method according to claim 137, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $\underline{e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}}$ wherein the filter

established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\operatorname{sin}\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\operatorname{sin}\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

[$e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}}a_{0_{s,m}}N_{s,m_{\rho_0}}N_{s,m_{z_0}}e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2}e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)}e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2}e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\operatorname{sin}\left(\left(k_\rho-n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\operatorname{sin}\left(\left(k_z-n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$
]

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ [$\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}$ and $\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}$] are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}}=v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}}=v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$, $N_{s,m_{z_0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

142. (Amended) A method according to claim 138, wherein $v_{s,m}t_{0_{s,m}}=\rho_{0_{s,m}}$ and $k_\rho=k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)$$

$$\left[\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}\left(v_{s\rho 0}k_\rho\right)} e^{-jk_\rho \rho_{fb_{s,m}}} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right)\right]$$

wherein $v_{s\rho 0}$ is a constant such as the signal propagation velocity in the ρ direction,

$\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ $\left[\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}\right]$ is a delay parameter and $\alpha_{s\rho 0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

193. (Amended) A computer-readable medium according to claim 189, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)} e^{-\frac{1}{2}\left(v_{sz 0}\frac{k_z}{\alpha_{sz 0}}\right)^2} e^{-j\frac{\sqrt{N_{sz 0}}}{\alpha_{sz 0}}\left(v_{sz 0}k_z\right)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} \frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\left(v_{s\rho 0}k_\rho\right)} e^{-\frac{1}{2}\left(v_{sz 0}\frac{k_z}{\alpha_{sz 0}}\right)^2} e^{-j\frac{\sqrt{N_{sz 0}}}{\alpha_{sz 0}}\left(v_{sz 0}k_z\right)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{ls,m}\right)} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho_0}}\rho_{0_{s,m}}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z_0}}z_{0_{s,m}}}{2}\right)$$

[$e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$]

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\underline{\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}}$ and $\underline{\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}}$ [$\sqrt{\frac{N_{sp0}}{\alpha_{sp0}}}$ and $\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}$] are delay parameters and α_{sp0} and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters

204. (Amended) A computer-readable medium according to claim 201, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{\frac{\left(t-\frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ [$\sqrt{\frac{N}{\alpha}}$] is a delay parameter, α is a half-width parameter, and t is the time parameter.

205. (Amended) A computer-readable medium according to claim 201, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

[231]
242. (Amended) A computer-readable medium according to claim <u>237</u>, wherein said probability operands having a value selected from a set of zero and one. cwe 3/14/01

[231]
244. (Amended) A computer-readable medium to claim <u>237</u>, wherein the high level memory is initialized with standard inputs. cwe 3/14/01

[231]
245. (Amended) A computer-readable medium to claim <u>237</u>, wherein the ordering is according to one of the list of: temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order. cwe 3/14/01

[231]
246. (Amended) A computer-readable medium to claim <u>237</u>, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled. cwe 3/14/01

[231]
247. (Amended) A computer-readable medium to claim <u>237</u>, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\underline{\frac{\sqrt{N}}{\alpha}}$ $\left[\sqrt{\frac{N}{\alpha}}\right]$ which corresponds to a time point. cwe 3/14/01

248. (Amended) A computer-readable medium to claim 247, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $\underline{e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}}$ <u>wherein the filter established the correct order to form the string, wherein the ordered string is represented by:</u>

$$\underline{\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)} e^{-jk_\rho\left(\rho_{fbs,m}+\rho_{ls,m}\right)} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)}$$

$e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty}\frac{4\pi}{1+\frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{\rho_0}} N_{s,m_{z_0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho\left(\rho_{fb_{s,m}}+\rho_{t_{s,m}}\right)}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)\sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein $v_{s\rho 0}$ and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, ~~$\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$~~ [$\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}$ and $\sqrt{\frac{N_{sz0}}{\alpha_{sz0}}}$] are delay parameters and $\alpha_{s\rho 0}$ and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}}t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho 0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

252. (Amended) A computer-readable medium to claim 248, wherein $v_{s,m}t_{0_{s,m}} = \rho_{0_{s,m}}$ and $k_\rho = k_z$ such that the string in Fourier space is one dimensional in terms of k_ρ and is represented by

$$\cancel{\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho 0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho\rho_{fb_{s,m}}}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)}$$

[$$\sum_{s=1}^{S}\sum_{m=1}^{M_s}\sum_{n=-\infty}^{\infty} a_{0_{s,m}} N_{s,m_{\rho 0}} e^{-\frac{1}{2}\left(v_{s\rho 0}\frac{k_\rho}{\alpha_{s\rho 0}}\right)^2} e^{-j\sqrt{\frac{N_{s\rho 0}}{\alpha_{s\rho 0}}}(v_{s\rho 0}k_\rho)} e^{-jk_\rho\rho_{fb_{s,m}}}\sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{\rho 0}}\rho_{0_{s,m}}}{2}\right)$$]

wherein $v_{s\rho 0}$ is a constant such as the signal propagation velocity in the ρ direction,

$$\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}} \qquad \left[\frac{\sqrt{N_{s\rho 0}}}{\alpha_{s\rho 0}}\right]$$

is a delay parameter and $\alpha_{s\rho 0}$ is a half-width parameter of a corresponding Gaussian filter in the k_ρ-space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s, and S are integers, and $N_{s,m_{\rho_0}}$ and $\rho_{0_{s,m}}$ are data parameters.

267. (Amended) A [method] <u>computer-readable medium</u> on which is stored a computer program for providing a method for recognizing a pattern in information comprising data and forming a predominant configuration, the computer program comprising instructions which, when executed by a computer, perform the steps of:

a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on an activation rate of the corresponding component;

b.) storing the activation probability parameter in memory;

c.) generating a probability operand based on the activation probability parameter;

d.) if said probability operand is a desired value, activating any component of one or more of the group consisting of an input layer, an association layer, a string ordering layer, and a predominant configuration layer, the activation being based on the activation probability parameter, wherein recognition of a pattern in information is achieved when said probability operand is said desired value, and

e.) repeating steps a-d to form a predominate configuration.

This explanation accompanies the Amendment filed on February 8, 2001. To reduce the issues for appeal, entry of the above-noted claim amendments is respectfully requested.

Respectfully submitted,

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